A Decision Making Approach Towards Personalized Medicine

Understanding the characteristics of information and the means of its transmission within cells has been a central focus of computational biology research during the last several years. At the same time, we lack an understanding of how one can use this knowledge to intervene and alleviate pathological cell behavior. My interest lies in identifying where and how one should intervene in the cell's biological decision-making processes to reduce the likelihood of the pathological cellular functions associated with cancerous phenotypes. To devise such therapeutic interventions, one can adapt model-based approaches by constructing a model for regulatory interactions in cells and then analyzing the model to make useful predictions about the behavior of cells responding to various stimuli. However, the paucity of available information, the large number of elements involved in regulatory processes, and the ability of cells to reconfigure their functionalities as a response to stimuli, hinder the use of model-based approaches to search for effective and robust therapeutic actions. To bypass the impediment of model inference and to mitigate the numerical problems associated with the model-based approaches, I will discuss model-free schemes for designing systems-based therapies. A model-free method estimates insightful statistics of the regulatory process directly from empirical measurements and utilizes them to devise therapeutic actions. These methods are robust to modeling errors, adapt to changes in the underlying biological system, and also provide tolerable computational burden. Finally, I will describe my ongoing collaboration with the Translational Genomics Research Institute (TGen), Phoenix, AZ, that aims at validating the efficacy of mathematically derived intervention strategies for altering the pathological behavior of cancerous cells.

Biography:

Golnaz Vahedi received the B.Sc. degree in electrical and computer engineering from Sharif University of Technology, Tehran, Iran, in 2001, and the M.Sc. degree also in electrical and computer engineering from the University of Alberta, Edmonton, Canada, in 2004. She is currently pursuing her Ph.D. degree in electrical & computer engineering at Texas A&M University, College Station. Her research interests lie in the areas of computational biology, genomic signal processing, and bioinformatics. She has been the winner of the 2004 Innovation-Research Contest of the Association of Health Technologies Industry, Montreal, Canada. She is a member of the IEEE Engineering in Medicine and Biology Society (EMBS), International Society for Computational Biology (ISCB), and Women in Science and Engineering (WISE).